

MYCOTAXON

<http://dx.doi.org/10.5248/130.899>

Volume 130, pp. 899–905

July–September 2015

New records of *Clauzadea* and *Immersaria* from ChinaLU-LU ZHANG[#], LING HU[#], XIANG-XIANG ZHAO, & ZUN-TIAN ZHAO^{*}

Key Laboratory of Plant Stress Research, College of Life Sciences,
Shandong Normal University, Jinan, 250014, P. R. China

^{*} CORRESPONDENCE TO: ztzhao@sohu.com

ABSTRACT —Three lichen species in the *Lecideaceae* (*Clauzadea monticola*, *Immersaria iranica*, *I. usbekica*) are reported for the first time from China.

KEY WORDS —*Lecideales*, Asia, taxonomy

Introduction

Lecideaceae Chevall. (Chevallier 1826, as ‘*Lecideae*’) originally included all crustose lecideoid lichen genera but now consists of relatively few genera with (crypo-)lecideine or (crypo-)lecanorine apothecia, mostly simple hyaline ascospores, and a *Lecidea*-type or *Porpidia*-type ascus structure. Currently the family contains about 23 genera and 547 species, of which the largest genus is *Lecidea* Ach., containing about 427 species (Kirk et al. 2008, Fryday & Hertel 2014). Two species of *Immersaria* Rambold & Pietschm. have been reported from China (Hertel 1977, Wei 1991; Aptroot & Sparrius 2003; Obermayer 2004) but no species of *Clauzadea* Hafellner & Bellem.

Clauzadea and *Immersaria* are closely related and are both characterized by a *Porpidia*-type ascus, $\pm$ halonate ascospores, and branched paraphyses. *Immersaria* can best be distinguished by its thick brown areolate thallus with a distinct epinecral layer, its immersed lecideine or lecanorine apothecia, and its siliceous or calcareous habitat, while *Clauzadea* has only lecideine apothecia and is restricted to calcareous rock (Rambold 1989, Thomson 1997, Calatayud & Rambold 1998, Smith et al. 2009, Valadbeigi et al. 2011).

During our research on the lecideoid taxa in China, we identified three species new to the country: *Clauzadea monticola*, *Immersaria iranica*, and *I. usbekica*.

[#] Lu-Lu Zhang & Ling Hu contributed equally.

Materials & methods

The studied specimens are preserved in the Lichen Section of the Botanical Herbarium, Shandong Normal University, Jinan, China (SDNU). Morphological and anatomical characters were examined under a stereo-microscope (COIC XTL7045B2) and a polarizing microscope (OLYMPUS CX41). The thalli and medullae were tested for identification with K (10% aqueous KOH solution), C (saturated aqueous NaClO solution), I (10% aqueous IKI solution), and P (saturated *p*-phenylenediamine solution in 95% ethyl alcohol). The lichen substances were identified using standardized thin layer chromatography techniques (TLC) with solvent system C (Orange et al. 2010). These lichens were photographed under OLYMPUS SZX16 and BX61 with DP72.

Taxonomic descriptions

Clauzadea monticola (Ach.) Hafellner & Bellem., Beih. Nova Hedwigia 79: 319 (1984)

FIG. 1

MORPHOLOGY — **THALLUS** granular to almost rimose and superficial, or $\pm$ immersed, brownish grey to ochre; medulla I–; prothallus absent. **APOTHECIA** sessile, constricted at the base, not forming pits; disc (0.3–)0.4–0.7(–0.9) mm diam., flat to convex, dark brown to black, becoming brownish when wet, not pruinose; margin slightly raised, generally persistent but sometimes finally excluded. **EXCIPLE** black-brown, 40–50 μ m wide, without crystals; **epihymenium** reddish brown, without crystals; **hymenium** hyaline, 65–80 μ m tall; **hypothecium** deep red brown, without crystals; **paraphyses** 2–3.5 μ m diam., branched and occasionally anastomosing, the apices capitate and widening to 5.0 μ m diam. **ASCI** clavate, *Porpidia*-type; **ascospores** hyaline, simple, ellipsoid, 9–12(–13) $\times$ 4–5.5 μ m, halonate when young, the perispore $\leq$ 1.5 μ m thick. **PYCNIIDIA** not observed.

CHEMISTRY — Thallus and medulla K–, C–, KC–, P–. No lichen substances were detected by TLC.

SPECIMENS EXAMINED: CHINA. XINJIANG, Chabuer, Mt. Wusongshan, alt. 2215 m, on rock, 10 Jun. 2014, P. M. Wang 20140049, 20140022, 20140012 (SDNU).

DISTRIBUTION — *Clauzadea monticola* has been reported from Asia, Africa, Europe, Macaronesia, North and South America, and New Zealand (Thomson 1997, Smith et al. 2009). New from China.

COMMENTS — *Clauzadea monticola* can be most easily distinguished from other *Clauzadea* species by its generally superficial thallus and sessile, epruinose apothecia. It is morphologically similar to *Lecidella stigmatea* and *Farnoldia jurana*, both of which occur in similar habitats. *Lecidella stigmatea* can be separated by its *Lecanora*-type ascus, larger non-halonate ascospores (11–17 $\times$ 6–9 μ m), and hyaline hypothecium (Thomson 1997), while *F. jurana* differs in its blue-green epihymenium, non-capitate paraphyses, larger apothecia (0.5–1.5 mm), and larger ascospores (13–28 $\times$ 7–14 μ m; Smith et al. 2009).

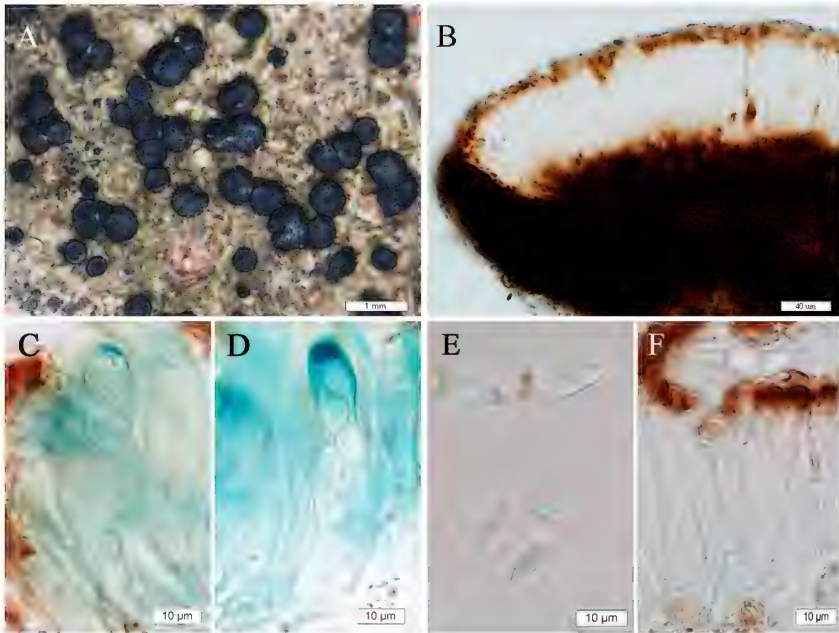


FIG. 1. *Clauzadea monticola* (Wang 20140049, SDNU). A: thallus; B: apothecium section; C: ascus and ascospores; D: amyloid reaction of ascus; E: ascospores; F: paraphyses.

Immersaria iranica Valadb., Sipman & Rambold, Lichenologist 43: 204 (2011) FIG. 2

MORPHOLOGY — **THALLUS** crustose, areolate, 0.3–0.4 mm thick; areoles brown to slightly reddish brown, flat to slightly convex, often with irregular, whitish rims; epinecral layer 15–23 μm high, (pheno-)cortical layer 30–40 μm thick; medulla I+; hypothallus black to grey, frequently visible between the areoles. **APOTHECIA** immersed, 0.3–0.6 mm diam., usually one per areole, round or angular, sometimes surrounded by a white rim, with crypto-lecanorine margin; disc black-brown, plane to weakly convex, epruinose. **EXCIPLE** thin to absent; epihymenium dark brown, 15–20 μm ; hymenium hyaline, 120–150 μm tall; hypothecium hyaline; paraphyses 1.5–3.5 μm diam., anastomosing and apically branched, apical cells widening slightly to 4.5 μm . **ASCI** clavate, *Porpidia*-type; ascospores hyaline, simple, ellipsoid to subglobose, 9–13(–15) $\times$ 5.5–7 μm , halonate. **PYCNIDIA** immersed, opening by $\pm$ stellate winding cracks ≤ 0.5 mm long; conidia clavate to occasionally pyriform, 3–5 $\times$ c. 1.5 μm .

CHEMISTRY — Thallus and medulla K–, C–, KC–, P–. No lichen substances were detected by TLC.

SPECIMENS EXAMINED: CHINA. XINJIANG, Urumqi, Mt. Tianshan-glacier No.1, alt. 3800 m, on rock, 27 Aug. 2011, Z.L. Huang 20126106, 20129049 (SDNU).

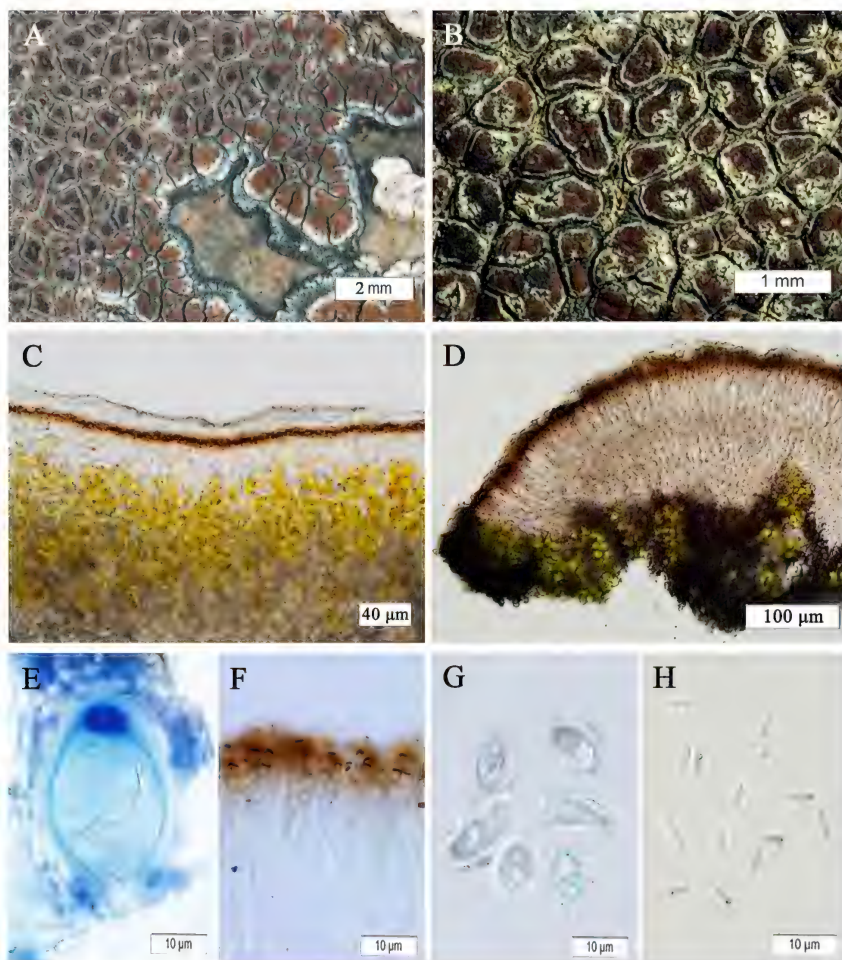


FIG. 2. *Immersaria iranica* (Huang 20126106 SDNU). A: thallus; B: pycnidia; C: thallus section; D: apothecium section; E: amyloid reaction of ascus; F: paraphyses; G: ascospores; H: conidia.

DISTRIBUTION — *Immersaria iranica* has been reported only from Iran (Valadbeigi et al. 2011). New from China.

COMMENTS — *Immersaria iranica* is characterized by the crypto-lecanorine apothecia, the I+ medulla, the pycnidia opening by $\pm$ stellate winding cracks, the round or lobed apothecia, and possession of 2'-O-methylsuperphyllinic acid (Valadbeigi 2011). The Chinese specimens differ in their non-lobed apothecia and lack of secondary substances.

Immersaria usbekica (Hertel) M. Barbero, Nav.-Ros. & Cl. Roux, Bull. Soc. Linn.

Provence 41: 140 (1990)

FIG. 3

MORPHOLOGY — THALLUS crustose, cracked-areolate, 0.15–0.5(–0.7) mm thick; areoles yellow-brown, flat to slightly convex; epinecral layer 14–20 μm high, (pheno-)cortical layer 25–35 μm thick; medulla I+; hypothallus black, more or less distinct between the areoles. APOTHECIA immersed, 0.2–0.5 mm diam., usually one or two per areole, with crypto-lecanorine margin; disc black-brown, plane to weakly concave, epruinose. EXCIPLE usually very

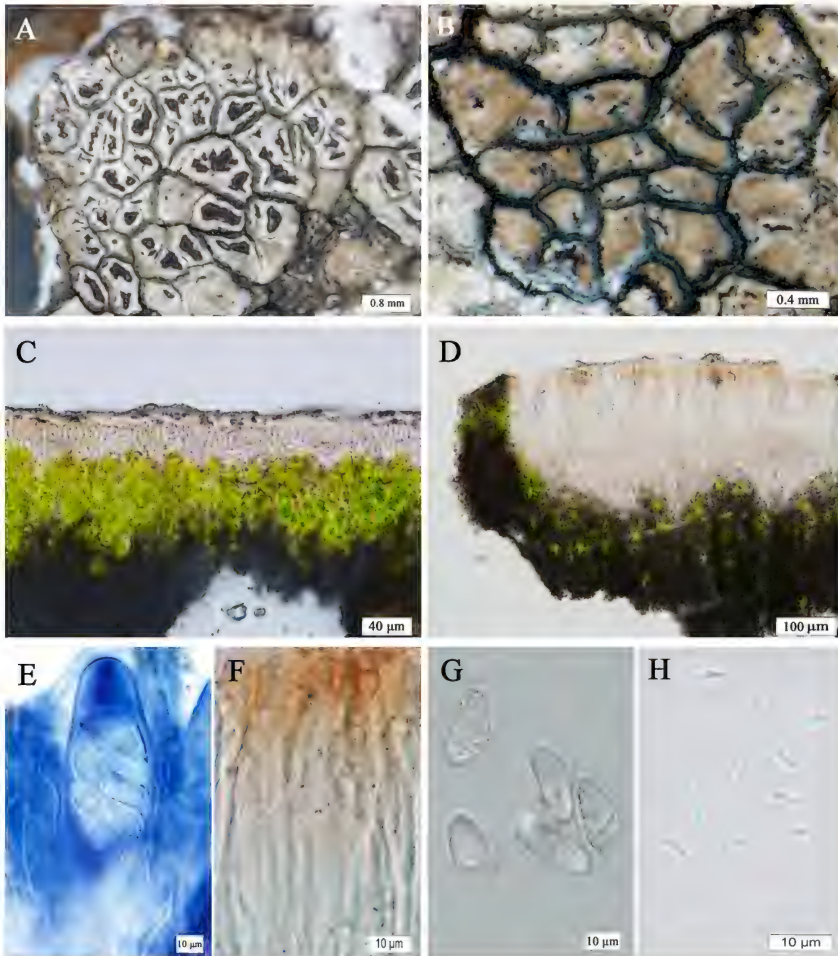


FIG. 3. *Immersaria usbekica* (Li 2013814, SDNU). A: thallus; B: pycnidia; C: thallus section; D: apothecium section; E: amyloid reaction of ascus; F: paraphyses; G: ascospores; H: conidia.

reduced where the apothecia are attached to the areoles and better developed where the apothecia reach the areole margins; epihymenium olive-brown to brown, 17–25 µm, hymenium hyaline, 125–140 µm tall; hypothecium hyaline; paraphyses 2.5–4 µm diam., anastomosing and apically branched, apical cells widening to 5.5 µm. ASCI clavate, *Porpidia*-type; ascospores hyaline, simple, ellipsoid, (15–)18–23 × 9–13 µm, halonate. PYCNIDIA immersed, opening by simple or graphidoid cracks up to 0.25 mm long; conidia short bacilliform, 4.5–6.5 × c. 1.5 µm.

CHEMISTRY — Thallus and medulla K–, C+ pale red, KC+ pale red, P–. Gyrophoric acid and a confluent acid syndrome were detected by TLC.

SPECIMEN EXAMINED: CHINA. XINJIANG, Urumqi, Xishuigou, alt. 1950 m, on rock, 7 Sep. 2013, S.X. Li 2013814 (SDNU).

DISTRIBUTION — *Immersaria usbekica* has been reported from Asia, Europe, and North Africa (Barbero et al. 1990; Hertel 1977, 2001; Valadbeigi et al. 2011). New to China.

COMMENTS — *Immersaria usbekica* is morphologically similar to *I. iranica* but differs by the presence gyrophoric and confluent acids, bacilliform conidia, and calcareous habitat.

Acknowledgements

The authors thank Dr. H. J. M. Sipman (Botanical Garden and Museum, Berlin, Germany) and Dr. Shou-Yu Guo (Chinese Academy of Sciences, Beijing, China) for presubmission reviews. We also thank Dr. Tahereh Valadbeigi for helping us identify *Immersaria iranica* specimens. This study was supported by the Program for Scientific Research Innovation Team in Colleges and Universities of Shandong Province, the National Natural Science Foundation of China (31170187, 31400015), the Foundation of the Key Laboratory, CAS (KLBB–201306), and the National Training Programs of Innovation and Entrepreneurship for Undergraduates (201410445093).

Literature cited

- Aptroot A, Sparrius LB. 2003. New microlichens from Taiwan. *Fungal Diversity* 14: 1–50.
- Barbero M, Navarro-Rosinés P, Roux C. 1990. *Immersaria usbekica* (Hertel) Barbero, Nav.-Ros. et Roux comb. nov. [= *Amygdalaria tellensis* Esnault et Roux] nove trovita en Europeo. *Bulletin de la Société Linnéenne de Provence* 41: 139–142.
- Calatayud V, Rambold G. 1998. Two new species of the lichen genus *Immersaria* (Porpidiaceae). *Lichenologist* 30: 231–244.
- Chevallier FF. 1826. *Flore générale des environs de Paris*. Paris: Ferra Jeune.
- Fryday AM, Hertel H. 2014. A contribution to the family *Lecideaceae* s. lat. (*Lecanoromycetidae* inc. sed., lichenized *Ascomycota*) in the southern subpolar region; including eight new species and some revised generic circumscriptions. *Lichenologist* 46: 389–412. <http://dx.doi.org/10.1017/S0024282913000704>
- Hertel H. 1977. Gesteinsbewohnende Arten der Sammelgattung *Lecidea* (Lichenes) aus Zentral-, Ost- und Südasien. Khumbu Himal, Ergebnisse des Forschungsunternehmens Nepal Himalaya 6: 145–378.

- Hertel H. 2001. Floristic and taxonomic notes on saxicolous lecideoid lichens. *Sendtnera* 7: 93–136.
- Kirk PM, Cannon PF, Minter DW, Stalpers JA. 2008. Dictionary of the fungi. 10th edition. CABI Bioscience: CAB International. 771 p.
- Obermayer W. 2004. Additions to the lichen flora of the Tibetan region. *Bibliotheca Lichenologica* 88: 479–526.
- Orange A, James PW, White FJ. 2010. Microchemical methods for the identification of lichens. 2nd edition. London: British Lichen Society.
- Rambold G. 1989. A monograph of the saxicolous lecideoid lichens of Australia (excl. Tasmania). *Bibliotheca Lichenologica* 34:1–345.
- Smith CW, Aptroot A, Coppins BJ, Fletcher A, Gilbert OL, James PW, Wolseley PA (eds). 2009. The lichens of Great Britain and Ireland. Natural History Museum Publications, in association with The British Lichen Society.
- Thomson JW. 1997. American Arctic lichens, vol. II. University of Wisconsin Press.
- Valadbeigi T, Sipman H, Rambold G. 2011. The genus *Immersaria* (*Lecideaceae*) in Iran, including *I. iranica* sp. nov. *Lichenologist* 43: 203–208.
- Wei JC. 1991. An enumeration of lichens in China. International Academic Publishers, Beijing.